CLAIMS:

1.   A traffic control system for scheduling fixed size traffic elements from a number of queues for transmission on a link, each queue having associated traffic parameters, the system comprising a scheduler and a calendar in a memory for storing a transmission

5   schedule of the queues, the scheduler shaping the transmission schedule by updating the schedule in the calendar in dependence on inputted traffic parameters of each queue, wherein the system includes an amplifier to amplify the traffic parameters by a factor K prior to input to the scheduler, the scheduler and calendar being adapted to operate using the amplified parameters.

10

2.   A traffic control system according to claim 1, further comprising a parameter memory arranged to store the amplified parameters as integers for input to the scheduler.

3.   A traffic control system according to claim 2, in which the traffic parameters

15 include quality of service parameters.

4.   A traffic control system according to claim 2, in which the transmission schedule for a respective queue is updated after a transmission from the queue.

20 5.   A traffic control system according to claim 4, in which the calendar comprises a linear array having a number of indices, each index corresponding to a transmission time and being capable of referencing a list of queues, queues referenced by a low value index being transmitted before queues referenced by a higher value index, wherein the updating of the transmission schedule comprises the recalculation of the index to refer to the

25 queue.

6.   A traffic control system according to claim 5, in which the scheduler recalculates the index using leaky bucket shaping.

30 7.   A traffic control system according to claim 6, in which the scheduler uses single leaky bucket shaping for queues having CBR class traffic.

8.   A traffic control system according to claim 7, in which the traffic parameters comprise the inverse of the respective queue's peak cell rate (1/PCR) and the queue's cell delay variation tolerance (CDVT), the parameters being calculated as:

$$I = \text{Integer} \left\{ \frac{LinkPCR[cells/s]}{QPCR[cells/s]} * K \right\}$$

$$L = \text{Integer} \left\{ CDVT[sec] * LinkPCR * K \right\},$$

where LinkPCR is the PCR of the link and QPCR is the PCR of the respective queue.

9.   A traffic control system according to claim 6, in which the scheduler uses dual leaky bucket shaping for queues having VBR class traffic.

10.   A traffic control system according to claim 9, in which the traffic parameters for the first leaky bucket comprise the inverse of the respective queue's peak cell rate (1/PCR) and the queue's cell delay variation tolerance (CDVT), the parameters being calculated as:

$$I = \text{Integer} \left\{ \frac{LinkPCR[cells/s]}{QPCR[cells/s]} * K \right\}$$

$$L = \text{Integer} \left\{ CDVT[sec] * LinkPCR * K \right\},$$

and the traffic parameters for the second leaky bucket comprise the inverse of the respective queue's sustainable cell rate (1/SCR) and the sum of the queue's cell delay variation tolerance (CDVT) and burst tolerance(BT), the parameters being calculated as:

$$I = \text{Integer} \left\{ \frac{LinkPCR[cells/s]}{QPCR[cells/s]} * K \right\}$$

$$L = \text{Integer} \left\{ BT[sec] * LinkPCR * K \right\} + \text{Integer} \left\{ CDVT[sec] * LinkPCR * K \right\}$$

where LinkPCR is the PCR of the link and QPCR is the PCR of the respective queue.

11.   A traffic control system according to claim 5, further comprising a transmitter arranged to traverse the array from lowest index to highest traversing one index per transmission time, wherein the transmitter allows a queue to transmit if it is referenced by the index currently traversed.

12.   A traffic control system according to claim 11, in which recalculation of the index results in the reference to the queue being moved to an index with a higher value.

5   13.   A traffic control system according to claim 12, in which a recalculation resulting in an index value greater than the maximum index of the array is adjusted so as to wrap around the array.

14.   A traffic control system according to claim 13, further comprising a memory for 10 storing the number of transmission times passed since each queue's last transmission, the value being used as a traffic parameter input to the scheduler.

15.   A traffic control system according to claim 1, comprising a Field Programmable Gate Array (FPGA).

15   16.   A traffic control system according to claim 1, comprising an application specific integrated circuit (ASIC).

17.   A traffic control method scheduling fixed size traffic elements from a number of 20 queues for transmission on a link, each queue having associated traffic parameters, the method comprising the steps of:

storing a transmission schedule of the queues in a memory;

shaping the transmission schedule by updating the schedule in the calendar in dependence on inputted traffic parameters of each queue;

25 wherein the step of shaping includes the step of amplifying the traffic parameters by a factor K, the memory and the shaping step being adapted to operate using the amplified parameters.

18.   A traffic control method according to claim 17, in which the amplified parameters 30 are truncated as integers.

19.   A traffic control method according to claim 17, in which the traffic parameters include quality of service parameters.

20.   A traffic control method according to claim 17, in which the transmission schedule for a respective queue is updated after a transmission from the queue.

21.   A traffic control method according to claim 17, in which the transmission schedule comprises a linear array having a number of indices, each index corresponding to a transmission time and being capable of referencing a list of queues, queues referenced by a low value index being transmitted before queues referenced by a higher value index, wherein the step of shaping includes the step of recalculating the value of the index that should refer to the queue.

22.   A traffic control method according to claim 21, in which the step of shaping comprises leaky bucket shaping.

23.   A traffic control method according to claim 22, in which single leaky bucket shaping is used for queues having CBR class traffic.

24.   A traffic control method according to claim 23, in which the traffic parameters comprise the inverse of the respective queue's peak cell rate (1/PCR) and the queue's cell delay variation tolerance (CDVT), the parameters being calculated as:

$$I = \text{Integer} \left\{ \frac{LinkPCR[cells/s]}{QPCR[cells/s]} * K \right\}$$

$$L = \text{Integer} \left\{ CDVT[\sec] * LinkPCR * K \right\},$$

where LinkPCR is the PCR of the link and QPCR is the PCR of the respective queue.

25.   A traffic control method according to claim 22, in which dual leaky bucket shaping is used for queues having VBR class traffic.

26.   A traffic control method according to claim 25, in which the traffic parameters for the first leaky bucket comprise the inverse of the respective queue's peak cell rate

(1/PCR) and the queue's cell delay variation tolerance (CDVT), the parameters being calculated as:

$$I = \text{Integer} \left\{ \frac{LinkPCR[cells/s]}{QPCR[cells/s]} * K \right\}$$

$$L = \text{Integer} \left\{ CDVT[\sec] * LinkPCR * K \right\},$$

5 and the traffic parameters for the second leaky bucket comprise the inverse of the respective queue's sustainable cell rate (1/SCR) and the sum of the queue's cell delay variation tolerance (CDVT) and burst tolerance(BT), the parameters being calculated as:

$$I = \text{Integer} \left\{ \frac{LinkPCR[cells/s]}{QPCR[cells/s]} * K \right\}$$

$$L = \text{Integer} \left\{ BT[\sec] * LinkPCR * K \right\} + \text{Integer} \left\{ CDVT[\sec] * LinkPCR * K \right\}$$

10 where LinkPCR is the PCR of the link and QPCR is the PCR of the respective queue.

27. A traffic control method according to claim 21, further comprising the step of traversing the array from the lowest index to the highest, traversing one index per transmission time, further comprising the step of allowing a queue to transmit if it is
15 referenced by the index currently traversed.

28. A traffic control method according to claim 27, in which recalculation of the index results in the reference to the queue being moved to an index with a higher value.

20 29. A traffic control method according to claim 28, in which a recalculation resulting in an index value greater than the maximum index of the array is adjusted so as to wrap around the array.

30. A traffic control method according to claim 29, further comprising the step of
25 storing the number of transmission times passed since each queue's last transmission, the value being used as a traffic parameter input.

31. A computer-readable medium, on which is stored a computer program of instructions for a processor to schedule fixed size traffic elements from a number of
30 queues for transmission on a link, each queue having associated traffic parameters, the

program comprising, in combination:

means for causing the processor to store a transmission schedule of the queues in a memory;

means for causing the processor to shape the transmission schedule by updating the schedule in the calendar in dependence on inputted traffic parameters of each queue;

wherein the means for causing the processor to shape the schedule includes means for amplifying in the memory the traffic parameters by a factor K, the means for causing the processor to shape the schedule being adapted to operate using the amplified parameters.

32.   A field programmable gate array programmed to execute scheduling of fixed size traffic elements from a number of queues for transmission on a link, each queue having associated traffic parameters, the program comprising the steps of:

storing a transmission schedule of the queues in a memory;

shaping the transmission schedule by updating the schedule in the calendar in dependence on inputted traffic parameters of each queue;

wherein the step of shaping includes the step of amplifying the traffic parameters by a factor K, the memory and the shaping step being adapted to operate using the amplified parameters.

33.   An application specific integrated circuit configured to execute scheduling of fixed size traffic elements from a number of queues for transmission on a link, each queue having associated traffic parameters, the program comprising the steps of:

storing a transmission schedule of the queues in a memory;

shaping the transmission schedule by updating the schedule in the calendar in dependence on inputted traffic parameters of each queue;

wherein the step of shaping includes the step of amplifying the traffic parameters by a factor K, the memory and the shaping step being adapted to operate using the amplified parameters.